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PROPOSED PLAN FOR SITE 8, FORMER HERBICIDE ORANGE STORAGE AREA AND ASSOCIATED AREAS NCBC GULFPORT MS

11/1/2001

NAVFAC SOUTHERN

Mississippi Department of Environmental Quality

Installation Restoration Program
November 2001

Proposed Plan for Site 8, Former Herbicide Orange Storage Area and Associated Areas Naval Construction Battalion Center Gulfport, Mississippi

NCBC ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for cleaning up the contaminated soil, soil ash, and sediments at Installation Restoration Site 8, the former Herbicide Orange (HO) storage area, and associated drainage ditches. In addition, this Plan includes summaries of other remedial alternatives evaluated for use at these sites. This document is issued by the Department of the Navy (Navy) and the Department of the Air Force (Air Force), herein referred to as the lead agencies for site activities, and the Mississippi Department of Environmental Quality (MDEQ) and the United States Environmental Protection Agency (EPA), herein referred to as the support agencies. The Navy and Air Force in consultation with the MDEQ and EPA, will select a final remedy for the sites after reviewing and considering all information submitted during the 30-day public comment period. Based on new information or public comments, the Navy and the Air Force in consultation with the MDEQ and EPA, may modify the Preferred Alternative or select another remedial alternative presented in this Plan. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

The Navy and the Air Force are issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This Proposed Plan summarizes information that can be found in greater detail in the Focused Feasibility Study report (Tetra Tech 2001b) and other documents contained in the Administrative Record file for Site 8. We encourage the public to review these documents to gain a more comprehensive understanding of Site 8 and other remedial activities that have been conducted at the site.

Dates to remember:
MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
April 4 – May 5, 2002
The Navy and the Air Force will accept written comments on the Proposed Plan during the public comment period.

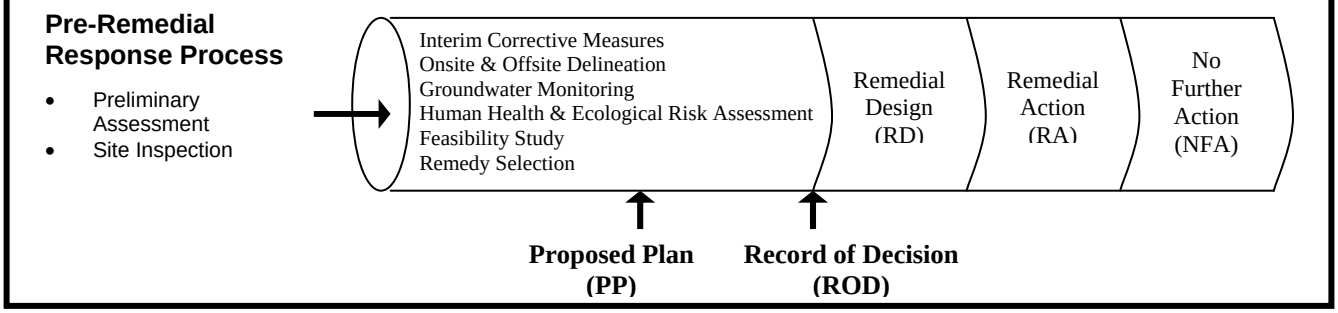
PUBLIC MEETING:
April 4, 2002
The Navy and the Air Force will hold a public meeting to explain the Proposed Plan and all the alternatives presented in the Feasibility Study report. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Isiah Fredericks Community Center, Gulfport, MS at 6:30-7:30 PM.

For more information, see the Administrative Record File at the following locations:

Env. Programs Manager
NCBC
5200 CBC 2nd Street
Gulfport, MS 39501
(228) 871-2485
7 AM to 3:30 PM (M-F)

Gulfport Public Library
1300 21st Avenue
Gulfport, MS 39501
(228) 863-6411
9 AM to 9 PM (M-Th)
9 AM to 5 PM (F-Sat)

Site 8 Remedial Response Process



SITE HISTORY

From 1968 through 1977, the Air Force used an area located at the central portion of NCBC Gulfport for storage and handling of approximately 850,000 gallons of HO in 55-gallon drums. Interviews with workers at NCBC indicated that spills and leaks were commonplace from drum ruptures and re-drumming efforts within the storage area. Investigations in the mid-1980s were focused on the 12-acre site (currently designated as Area A) which was the main area where HO drums were stored. However, two additional areas, currently designated as the 17-acre Area B and a 1-acre Area C, were identified as overflow sites for additional drum storage. Collectively, Areas A, B, and C and the drainage ditches associated with them (Figure 1A and Figure 3), and Areas 1 and 2 north of Outfall 3 (Figure 1B) are the areas referred to as the Installation Restoration Site 8

What is Herbicide Orange?

Herbicide Orange or HO is a herbicide formulation used during the Vietnam War to defoliate trees and shrubbery. It is an equal mix of two agricultural herbicides in diesel fuel or jet fuel. HO is also known as "**Agent Orange,"** a code name for the orange band that was used to mark the drums used to store the herbicide mix.

Since 1970, various Air Force contractors and contract laboratories have been conducting environmental surveys and analyses of the soils, plants, and the aquatic system in and around the HO storage area.

In 1977 with a permit from the EPA, the Air Force completed the removal and destruction at-sea of all the drums of HO stored at NCBC. The Air Force also initiated the investigation on the magnitude of HO spills at the known storage areas. The results of the initial monitoring program conducted in 1984 (HAZWRAP 1991) confirmed that the surface soil at the former storage areas was contaminated with herbicide components of HO and "dioxins"(see page 5 for definition of "dioxins). Dioxins were also detected in the soil and sediments of the drainage ditches associated with Site 8 as well as the wildlife living in those ditches including snails, fish, tadpoles, crayfish, and insects. The specific type of dioxin found in HO is **TCDD** or **2,3,7,8-tetrachlorodibenzo-p-dioxin**, a manufacturing by-product of herbicide orange. Based on these results, a Comprehensive Soil Characterization Study was conducted in 1987 through 1988 to determine the extent of HO and dioxin contamination (EG&G 1988). Results of this study indicated levels up to 1,000 parts dioxin per billion parts soil (ppb). Most of the dioxins were confined within 2 feet below ground surface with concentrations decreasing with depth.

Units of Concentrations:

ppb or parts per billion: One microgram of dioxin per kilogram of soil or per liter of water. One ppb can also be interpreted as one minute in 2,000 years, or a single penny in $10,000,000.

ppt or parts per trillion: One nanogram of dioxin per kilogram of soil or per liter of water. One ppt can also be interpreted as one minute in 2,000,000 years, or a single penny in $10,000,000,000.

ppq or parts per quadrillion: One picogram of dioxin per kilogram soil or per liter of water. One ppq can also be interpreted as one minute in 2,000,000,000 years, or a single penny in $10,000,000,000,000.

Between 1987 and 1988, the Air Force excavated an estimated 27,000 cubic yards of soil containing more than 1 ppb dioxin and incinerated it on-site at NCBC. The resulting ashes were stored at Area 8A. The soil study conducted by EG&G included an off-site dioxin contamination survey, which confirmed off-site migration of dioxin.

Investigations conducted in areas receiving drainage from Site 8 since 1995 have confirmed the presence of dioxin but not the agricultural herbicides. Dioxins are resistant to chemical breakdown but herbicides have broken down to non-detectable levels. Analysis for other contaminants including volatile organic compounds and semi-volatile organic compounds (VOC's and SVOC's), total petroleum hydrocarbons (TPH's), pesticides, and polychlorinated biphenyls (PCBs) have consistently confirmed that dioxins are the only contaminants of concern present at Site 8 and the associated drainage ditches (Tetra Tech 2001a).

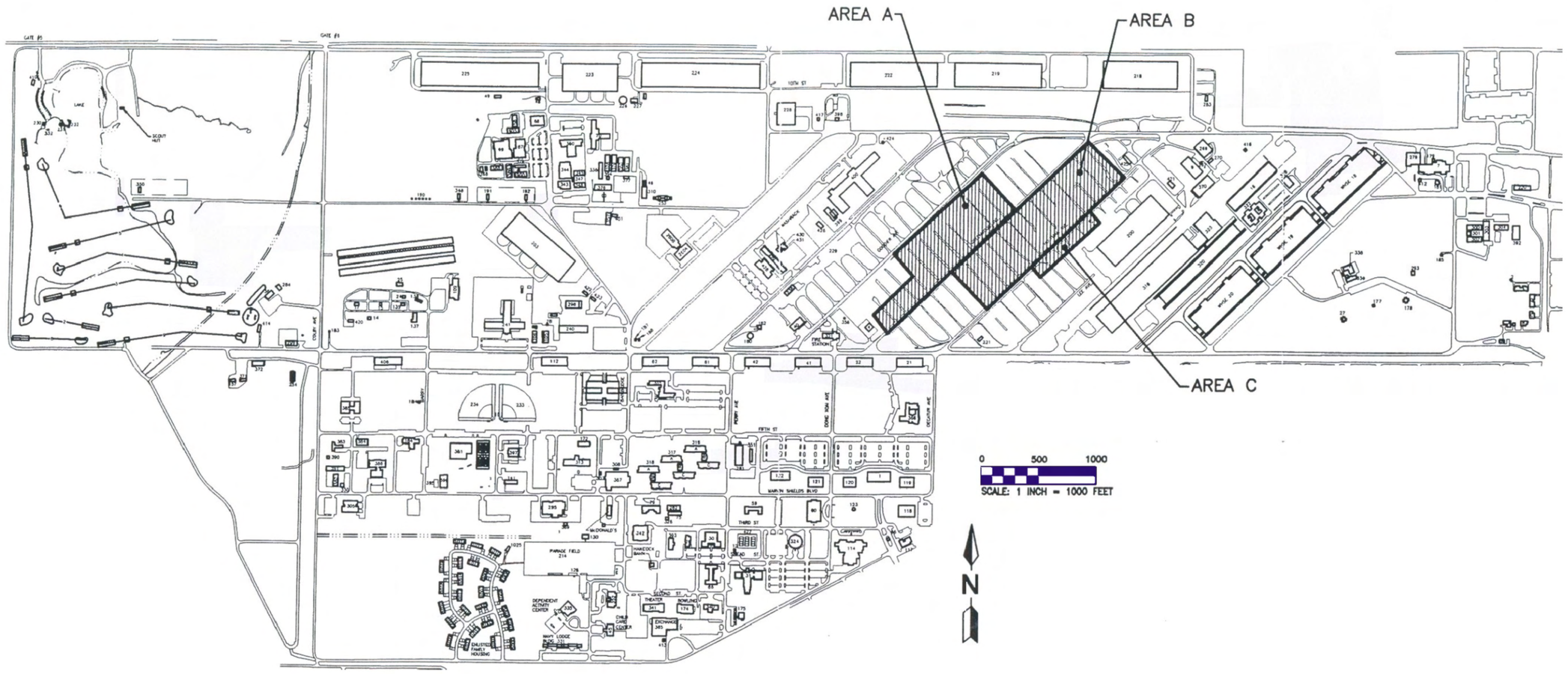


FIGURE 1A

FORMER HO STORAGE AREAS
8A, 8B, AND 8C

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

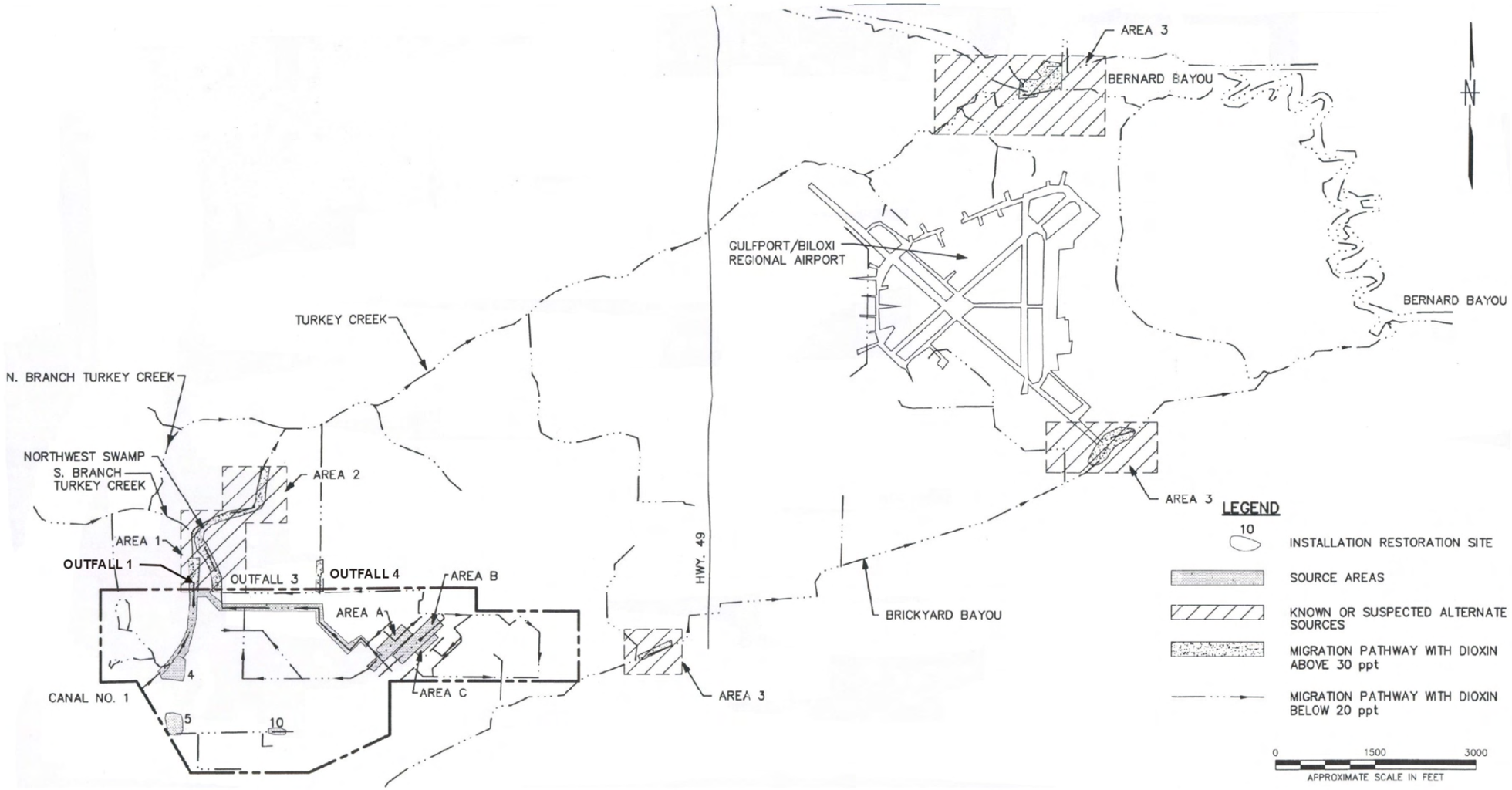


FIGURE 1B

OFF-BASE HO-CONTAMINATED AREAS

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

During the Defense Construction Roadway project along 28th Street in mid-1995, sediments containing dioxins were found up to 3 feet below the soil surface at stormwater Outfalls 1, 3, and 4 (Figure 1B). An interim removal action was conducted to excavate the contaminated sediments and place them on Area 8A as approved by the MDEQ (ABB-ES, 1995). Between 1995 and 1997 two interim corrective measures were implemented to control migration of dioxin contamination off-base. The interim corrective measures involved the installation and upgrade of 15 Sediment Recovery Traps at various points along the drainage ditches associated with Site 8 Areas A, B, and C to stop erosion of dioxin-contaminated sediment.

Currently, the former herbicide orange storage area, Area 8A, is used to store construction debris and dioxin contaminated sediments excavated from on-base drainage ditches. Areas 8B and 8C are open areas currently vegetated with native plants. Figure 2 is a recent aerial photo showing approximate boundaries for Areas 8A, 8B, and 8C.

REGULATORY BACKGROUND

In July 1986, the EPA issued a Research Development and Demonstration Permit to the Air Force to conduct excavation followed by on-site incineration of contaminated soil based on the 1 ppb cleanup criterion for dioxin. Later the ashes were delisted by MDEQ.

In 1990, the MDEQ promulgated more stringent cleanup levels for dioxins. Under this regulatory update, the dioxin action levels for residential use were established at 4.3 parts per trillion (ppt) in soil and 30 parts per quadrillion (ppq) in groundwater.

How are dioxins measured and reported?

Because dioxin congeners are not equally toxic, dioxins are usually reported in **TEQ or Toxic Equivalent**. **TEQ** is the quantitative measure of the combined toxicity of a mixture of dioxin congeners. **TEQ** is determined by multiplying the concentration of a congener by its assigned **TEF or Toxic Equivalency Factor**. TCDD is assigned the highest **TEF** value of "1" and the rest of the congeners are assigned a fraction indicating less toxicity relative to TCDD.

In February 14, 1996, the MDEQ issued Administrative Orders No. 3193-96 and No. 3194-96 to the Navy and the Air Force, respectively. In November 1997, these Administrative Orders were replaced by a joint Agreed Order Number 3466-97 that required further delineation, and if warranted, remediation of dioxin that may be present in surface soils, sediment, and/or groundwater in Site 8 and associated drainage areas.

What are the Contaminants of Concern?

The Agreed Order No. 3466-97 identified dioxins as the **Contaminants of Concern** at Installation Restoration Site 8. For residential or unrestricted property use, the amounts of dioxins currently allowed by MDEQ are 4.3 ppt in soil and 30 ppq in groundwater.

Dioxin is a term used to refer to a group of chemicals known as polychlorinated dibenzodioxins and furans. There are 17 forms or "congeners" of dioxins and furans of varying toxicities that were considered during Site 8 investigations. The most toxic congener is **2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD**, a known impurity by-product during manufacture of **2,4,5-T**, an agricultural herbicide banned for use in the United States since 1989.

According to EPA Fact Sheets, TCDD do not occur naturally nor are they intentionally manufactured. Dioxins occur as contaminants in the manufacturing process of certain commercial products including pentachlorophenol (a wood preservative), hexachlorophene (a bacteriocide), and the herbicide 2,4,5-T. Dioxins have been released to the environment during the manufacturing, use, and disposal of these chemicals. Dioxins are also formed during the chlorine bleaching process used by pulp and paper mills and enter the environment in wastewater effluent from these plants. Currently, the major environmental source of dioxins is emissions from the incineration of municipal refuse and certain chemical wastes. Other known sources include burning of leaded gasoline in the past, wood burning in the presence of chlorine, accidental fires involving electrical transformers containing PCBs and chlorinated benzenes, and improper disposal of certain chlorinated chemical wastes.

According to information provided by the Agency for Toxic Substances and Disease Registry, studies in animals demonstrated a wider range of effects associated with dioxin exposure including death, cancer, and wasting, as well as hepatic, immunologic, neurologic, reproductive, and developmental effects. In contrast to laboratory results, direct exposure information is not available in human studies.

Dioxins including TCDD are very stable in the environment, have low solubility in water, and bind strongly to soil and sediments.

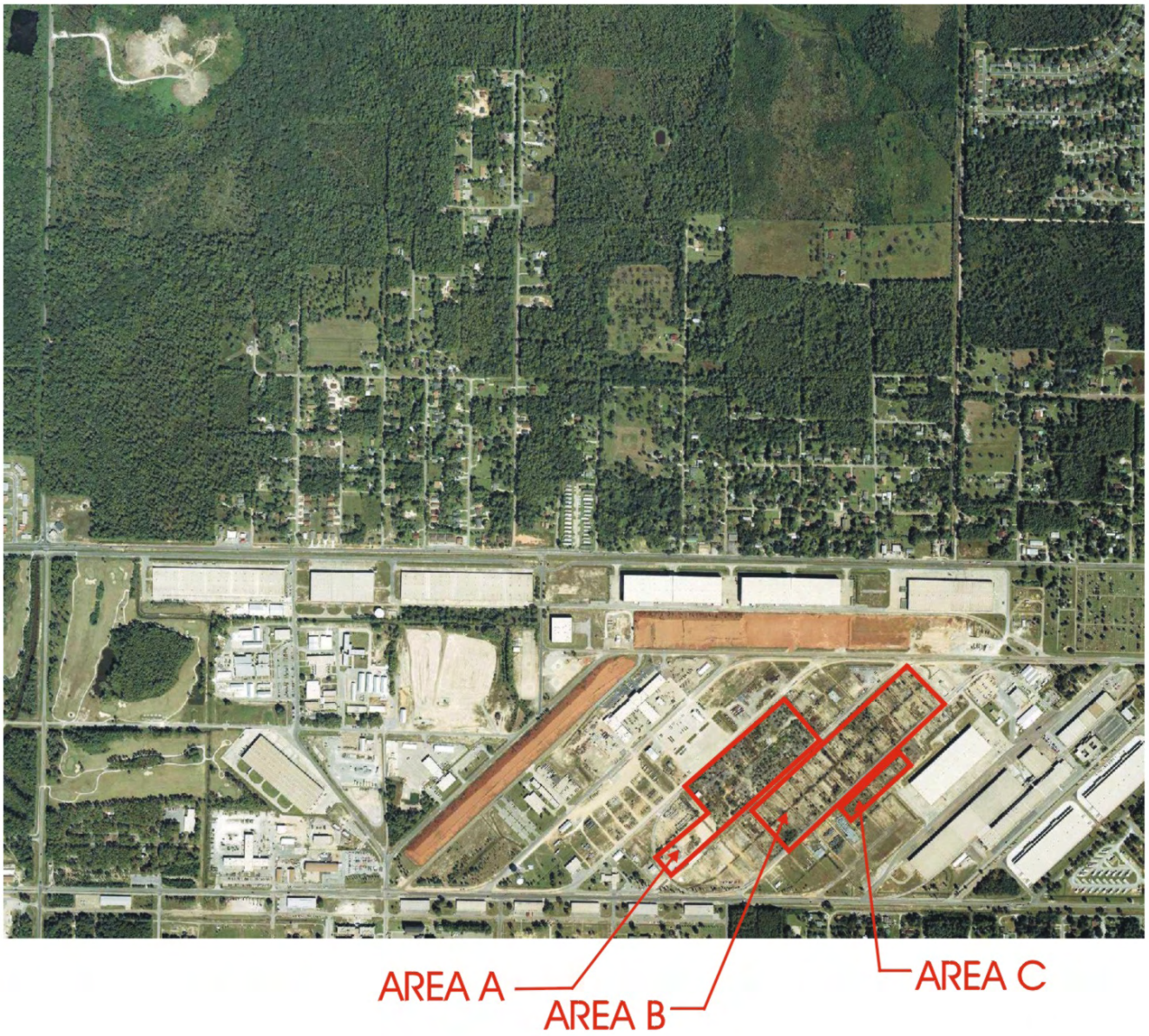


FIGURE 2

AERIAL PHOTO SHOWING
APPROXIMATE SITE BOUNDARIES OF
AREAS 8A, 8B, AND 8C

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

In February 2000, the Air Force and the Navy proposed to cleanup the off-base areas contaminated with dioxin from the herbicide orange under the Mississippi Brownfields Program. Under this program, the contaminated properties will be remediated under less stringent criteria but still protective of human health and the environment. This will allow these off-base areas to be developed expediently as a light industrial complex and put to productive use. The Brownfields program also provides owners of the contaminated properties protection from future state litigation.

In September 2001, the Air Force and the Navy submitted a Draft Focused Feasibility Study (FFS) report to MDEQ and EPA Region IV. The Draft FFS was approved by MDEQ with minor comments on October 29, 2001. The FFS summarizes the Preferred Alternatives that were considered to cleanup Site 8 and associated areas. The FFS was submitted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Agreed Order No. 3466-97 issued by MDEQ in November 1997.

SITE CHARACTERISTICS

NCBC Gulfport is located in the western part of Gulfport, Mississippi, in Harrison County, in the southeastern corner of the state. This naval facility is approximately 2 miles north of the Gulf of Mexico. The base occupies approximately 1,100 acres with average elevation of 23 feet above sea level and little topographic relief. Most of the NCBC is located within the 76 square mile Bernard Bayou waterlogged area that flows to Biloxi Bay. Other waterlogged areas include Brickyard Bayou to the southeast and Turkey Creek to the north.

Site 8 (Former HO Storage Area)

During construction in 1942, a 30-acre open area located between Goodier and Lee Avenues inside the NCBC was treated with cement and compacted. This formed a 6 to 12-inch layer of hardened, stabilized surface soil that is ideal for open storage. This open area constitutes what is now referred to as the former HO storage area, Areas 8A, 8B, and 8C.

The initial HO monitoring program conducted by the Air Force in 1977 identified the former HO storage area as the primary source of dioxin contamination at NCBC. Subsequent investigations in 1986 through 1988 identified dioxins, specifically TCDD, as the contaminant of concern for the site. Past investigations delineated the extent of dioxin contamination at the former HO storage area to 1 ppb. This concentration was the action level permitted by the EPA during the on-site incineration of dioxin-contaminated soils in 1988. Presently, Areas 8A, 8B, and 8C are re-vegetated with native plants.

Drainage Ditches and Other Associated Areas

As shown on Figure 3, surface runoff at the NCBC is conveyed off base by a system of drainage ditches and storm sewers. The majority of the NCBC drains into Canal Number 1, which is the major drainage channel at the base. The unlined drainage ditches at the site are divided into three separate drainage areas 1, 2, and 3. Runoff from Area 8A and most of Area 8B are conveyed by the system of ditches in drainage area 1 toward the northwest. A small portion of Area 8B drains into drainage area 2, which flows north toward 28th Street and then flows west along the NCBC property line. Runoffs from drainage areas 1 and 2 join and flow into Canal Number 1. Runoff from Area 8C flows into drainage ditches that are part of drainage area 3. This system of ditches conveys runoff toward the southern boundary of the NCBC and empties into Brickyard Bayou. Since the remedial activities in 1988, the most significant source of dioxins remains the sediment in the ditch systems that convey drainage water from the Areas 8A, 8B, and 8C. Contaminated sediments are migrating off base through Outfall 1, Outfall 3, and Outfall 4.

Highlights of Previous Investigations

- Dioxins in ash samples from the on-site incineration in 1988 ranged from non-detect to 60 ppt. Results from the toxicity characteristic leaching procedure (a test used to simulate leaching potential in landfills) were less than 3 ppt dioxins.
- Dioxins in sediments were detected between 0.2 ppt at drainage area 3 to 4000 ppt at drainage area 2.
- Dioxins in surface soil samples from within and around Site 8 ranged from 15 ppt to 181.4 ppt.
- Dioxins in surface water ranged from undetected to 36.6 ppq.
- VOCs, SVOCs, TPH, pesticides and PCBs were not detected in the other samples analyzed.
- Dioxin migration was predominantly through sediment transport and not as dissolved or suspended load in surface water. Sediments rich in organic matter tend to have higher levels of dioxins.
- Sediment samples from Turkey Creek between Canal Road and Bernard Bayou contain less than 10 ppt dioxins.

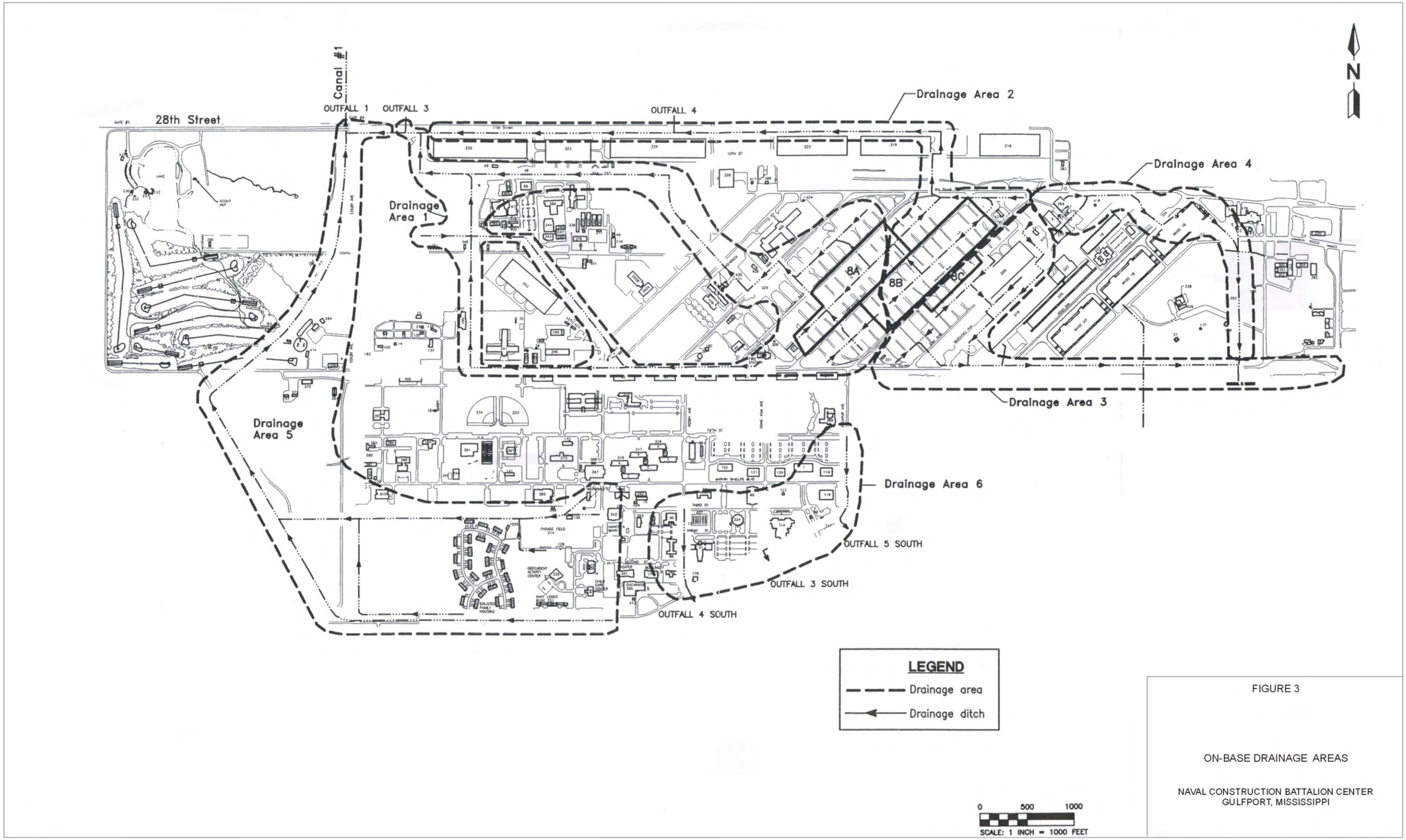


FIGURE 3

ON-BASE DRAINAGE AREAS

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

The highest concentrations of dioxins were detected in the surface soil and ditch sediments immediately adjacent to the former HO storage areas in drainage areas 1, 2, and 3. Dioxin levels decrease with distance from Site 8 with the exception of Outfall 3 swamp areas that received dioxin-contaminated sediments. Detections of dioxins in the on-base ditches include segments without discernable trend in the distribution or spread of dioxin contamination.

Previous investigations have demonstrated that shallow dioxin contamination has not migrated deeper than three feet below the ground surface at the former HO storage area. In the drainage ditches, there is no evidence that dioxin-contamination has migrated below the sediment layer.

SCOPE AND ROLE OF THE ACTION

The contaminated soils at Site 8 and ditch sediments at the Outfall 3 area can be considered "principal threat wastes" because the contaminants of concern are found at concentrations that could pose a significant human health risk. The excess carcinogenic risks to the on-base resident, occupational worker and site worker is upwards of six in one hundred thousand (6×10^{-5}). This means that, if the contaminated soil and sediments are not remediated, as many as six out of 100,000 individuals exposed to the soil and sediments could develop cancer as a result of that exposure. Although dioxins detected in surface waters and groundwater also pose a risk, it is not considered a "principal threat" as defined by the EPA (see definition box on this page).

The preferred remedial alternative described in this Proposed Plan would be the final action for the former HO storage area and associated areas. The off base swamp areas will be remediated under the MDEQ Brownfields Program. The remedial action objectives (RAOs) for the soil and sediment at Site 8 and associated areas are: (1) to protect human health from the carcinogenic and non-carcinogenic risks associated with incidental ingestion and inhalation of, and dermal contact with dioxin-contaminated soil and sediment, and (2) to comply with State and Federal applicable or relevant and appropriate requirements (ARARs) and To-Be-Considered (TBCs) guidance criteria (Table 1). Through removal, chemical stabilization, and containment technologies in combination with post-removal site controls such as land use controls and long-term monitoring, the preferred remedial alternative will permanently reduce the mobility of the principal threat wastes and eliminate unacceptable risk at Site 8 and associated drainage ditches.

What is a "Principal Threat"?

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that present a significant risk to human health or the environment should exposure occur. The NCP establishes an expectation to use treatment, containment, or combination of methods, as appropriate to address the principal threats posed by a site whenever practicable (Section 300.430(a)(1)(iii)). The "principal threat" concept is applied to the characterization of "source materials," which include or contain hazardous substances or pollutants that act as a reservoir for migration of contamination to groundwater, surface water or air, or act as a source for direct exposure. In general, contaminated groundwater is not considered to be a source material unless the presence of non-aqueous phase liquids (NAPLs) is confirmed. The decision to remediate these wastes is made on a site-specific basis through a detailed analysis of alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

SUMMARY OF SITE RISKS

As part of the remedial investigation and as required by the Agreed Order, a multi-phase Human Health and Ecological Risk Assessment was conducted at NCBC Gulfport from 1997 to 1999 (HLA 2001). The risk assessment included the following:

- Community Survey and Exposure Assessment to gather site-specific data on potential human exposure pathways to the dioxins in the ditch systems.
- Surface Water and Sediment Delineation of on base and off base dioxin contamination prior to developing the remediation plans. Divided into two phases, this delineation provided the majority of the analytical data used to support the Human Health and Ecological Risk Assessment.

Data from the risk assessment studies were used to determine the probability or likelihood that public health and the environment may be impacted from exposures to dioxins that are present in soil, sediments and surface waters migrating from Site 8.

Table 1
Applicable or Relevant and Appropriate Requirements and To Be Considered Criteria

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Federal			
EPA Region III Risk-Based Concentration Table	Provides risk-based concentrations for screening of soil	Relevant and Appropriate. These guidelines aid in the screening of chemicals in soil.	Chemical-specific
CERCLA and the NCP Regulations (40 CFR, Section 300.430)	Discusses the types of LUCs to be established at CERCLA sites.	Applicable. These requirements may be used as guidance in establishing appropriate LUCs at Site 8.	Action-specific
Occupational Safety and Health Act (OSHA) (29 CFR Part 1910)	Requires establishment of programs to ensure worker health and safety at hazardous waste sites.	Applicable. These requirements apply to response activities conducted in accordance with the NCP. During the implementation of any remedial alternative for Site 8, these regulations must be followed.	Action-specific
Hazardous Materials Transportation Act Regulations (49 CFR 171-179)	Provides requirements for packaging, labeling, manifesting and transporting hazardous materials.	Applicable. If soil is excavated and transported and is found to be hazardous, the soil would need to be handled, manifested, and transported as a hazardous waste.	Action-specific
National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61)	Standards promulgated under the Clean Air Act for significant sources of hazardous air pollutants.	Relevant and Appropriate. Remedial Action (e.g., soil excavation) may result in release of hazardous air pollutants.	Action-specific
Resource Conservation and Recovery Act (RCRA) Treatment Storage, and Disposal of Hazardous Waste (40 CFR 262-266)	Regulates the treatment, storage, and disposal of hazardous waste.	Relevant and Appropriate. Hazardous waste generated by site remediation must meet RCRA generator and treatment, storage, or disposal requirements.	Action-specific
Land Disposal Restrictions (40 CFR Part 61)	Restricts certain listed or characteristic hazardous waste from placement or disposal on land without treatment	Relevant and Appropriate. Excavated soil or treatment residuals (such as spent granular activated carbon) may require disposal in a landfill.	Action-specific
State			
MDEQ Target Risk Goals (TRGs) (MS Code Section 49-35-21)	Default Screening Levels. Human Health risk-based cleanup goals for soil.	Applicable. These regulations apply to all remedial actions in the State of Mississippi.	Chemical-specific
MDEQ Risk Evaluation Procedures for Voluntary Cleanup and Redevelopment	Risk-based procedures and rationale for site evaluation and remediation.	TBC. These regulations apply to all Voluntary Cleanup and Brownfield actions in the State of Mississippi.	Guidance
MDEQ Office of Pollution Control Hazardous Waste Management Regulations	Adopts by reference, specific sections of the Federal Hazardous Waste regulations.	Relevant and Appropriate. These regulations may apply if material is removed from the Base.	Action-specific.
This table was reproduced from the Focused Feasibility Study (Tetra Tech 2001b)			

According to the NCBC Gulfport long range planners, the current and future land use for Site 8 and associated on-base drainage ditches is for industrial-type activities supporting the base mission. There is no known human health or ecological risk from groundwater since previous investigations have confirmed that it was not impacted by dioxins released from the former HO storage area. The land areas surrounding the former HO storage area including north of Outfall 3 are privately owned with multi-purpose uses including residential, commercial, light industrial and open space. As part of the Mississippi Brownfields Program, future land use for the privately-owned lands north of Outfall 3 will be restricted to light industrial complex use. Under this program, the productive use of properties can be accelerated by tailoring the cleanup criteria to fit the current and/or future use of the properties while maintaining protection of human health and the environment.

Hence, the risk assessment focused on health effects to on-base residents in a residential setting, and occupational and excavation workers in an industrial setting that could result from current and future direct contact with contaminated soil and sediment through ingestion and dermal contact. It is the Air Force's and the Navy's current judgement that the Preferred Alternative identified or one of the other remedial measures considered in this Proposed Plan is necessary to protect public health or the environment from actual or threatened releases of dioxins.

Human Health Risks

Dioxin-contaminated soil and sediment were determined to be the media that present the potential for dioxin exposure at Site 8 and associated areas. The highest levels of human exposure to dioxin that could be reasonably expected at the on-base areas were determined to be 99.5 ppt in soil and 365 ppt in sediment. In risk assessment, these values are also known as the reasonable maximum exposure (RME) concentrations. At the off-base areas, RME concentrations of dioxins are 79 ppt in soil and 30 ppt in sediment.

Under current and future land use scenarios, the RME concentrations are associated with individual lifetime cancer risks due to ingestion, dermal contact, and fugitive dust inhalation. These risk levels indicate that there is significant potential risk to receptors, which include children, adults, trespassers, and site workers (occupational or excavation workers) from direct exposure to contaminated soil and sediment. These risk estimates are based on current RME scenarios, which were developed by taking into account various conservative assumptions. These assumptions include the frequency and duration of an individual's exposure; the media contaminated with dioxins (i.e., soil, soil dusts, and sediment); as well as known toxicity of dioxins. Table 2 shows the upper bound probability of cancer risk when different receptors are exposed to the RME concentrations in soil and sediment on-base and off-base. These estimates are based on known exposure routes or pathways by which dioxins could enter the human body.

WHAT IS RISK AND HOW IS IT CALCULATED?

A human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at the site. To estimate the baseline risk, the Navy and Air Force have undertaken a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

Step 1 involves determining the concentration of HO-related contaminants found at Site 8 and associated areas as well as previous studies on the effects of these contaminants to people (or animals when human studies are unavailable). Comparisons between the site-specific concentrations and those reported during past studies help determine which contaminants are most likely to pose the greatest threat to human health.

Step 2 involves considering the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, "reasonable maximum exposure" (**RME**) scenarios are calculated, which portray the highest level of human exposure that could reasonably be expected to occur.

Step 3 involves combining the information from Step 2 and known toxicities of the contaminants to assess two types of potential health risks: cancer risk and non-cancer risk. The likelihood of any kind of cancer as a result of exposure to the **RMEs** is generally expressed as an upper bound probability; for example, a "1 in 1,000,000" chance." This means that for every 1,000,000 people that could be exposed, one extra cancer may occur as a result of exposure to dioxins. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes.

Step 4 involves determining whether site risks are great enough to cause health problems for people at or near the contaminated media. Results from Steps 1 to 3 are combined, evaluated and summarized. At the end, total site risk is calculated by adding the potential risks from the contaminants and exposure pathways.

Table 2
Summary of Human Health Risks
Current and Potential Future Land Use Scenarios

Receptor	Media of Concern	Exposure Route	Cancer Risk Based on RME Concentrations
Current Land Use			
On-base Receptors			
Total Resident	Non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	3.0×10^{-5}
Total Trespasser	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	6.0×10^{-6}
Occupational Worker	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	7.0×10^{-6}
Site Worker	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	2.0×10^{-6}
Excavation Worker	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	7.0×10^{-6}
Off-base Receptors			
Total Resident	Off-base sediment	Ingestion and dermal contact	8.0×10^{-7}
Total Trespasser	Off-base sediment	Ingestion and dermal contact	2.0×10^{-7}
Occupational Worker	Off-base sediment	Ingestion and dermal contact	1.0×10^{-7}
Occupational Worker	Off-base deep water sediment, Area 3	Ingestion and dermal contact	6.0×10^{-8}
Site Worker	Off-base sediment	Ingestion and dermal contact	8.0×10^{-8}
Excavation Worker	Off-base sediment	Ingestion and dermal contact	4.0×10^{-8}
Future Land Use			
On-base Receptors			
Total Resident	Non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	6.0×10^{-5}
Total Trespasser	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	6.0×10^{-6}
Occupational Worker	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	7.0×10^{-6}
Site Worker	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	2.0×10^{-6}
Excavation Worker	Site 8 soil, non-Site 8 soil, on-base sediment	Ingestion, dermal contact, and fugitive dust inhalation	7.0×10^{-7}
Off-base Receptors			
Total Resident	Off-base sediment	Ingestion and dermal contact	8.0×10^{-7}
Total Trespasser	Off-base sediment	Ingestion and dermal contact	2.0×10^{-7}
Occupational Worker	Off-base sediment	Ingestion and dermal contact	1.0×10^{-7}
Occupational Worker	Off-base deep water sediment, Area 3	Ingestion and dermal contact	6.0×10^{-8}
Site Worker	Off-base sediment	Ingestion and dermal contact	8.0×10^{-8}
Excavation Worker	Off-base sediment	Ingestion and dermal contact	4.0×10^{-8}

Notes:
Exposure Route – the known pathway through which a foreign substance could enter the human body.
RME – reasonable maximum exposure

Ecological Risks

Fifty-six biological samples including whole fish and filets were collected and analyzed for dioxins. The data set included most edible species found in the study area (i.e., largemouth bass, catfish, striped mullet, and bluegill). None of the HO-related chemical compounds was detected in these ecological samples above the MDEQ Tier 1 screening levels and the EPA Region III risk-based concentrations. Based upon these findings, the potential for significant ecological impacts could be eliminated. More information on the ecological assessment can be found in the *Human and Ecological Risk Baseline Risk Assessment* (HLA 2001).

REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) for the site are to:

- Protect human health from carcinogenic and non-carcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with contaminated surface soil and sediment. It is the Navy and Air Force judgement that this RAO can be met by the preferred alternative that combines excavation, chemical-stabilization and landfilling, capping, and monitoring technologies combined with post removal site controls.
- Comply with Federal and State ARARs and TBC guidance criteria in accordance with accepted EPA and MDEQ guidelines (Table 1).

The proposed remedial technologies will reduce the excess cancer risk associated with exposure to contaminated soil and sediment to one in one million. This will be achieved by reducing the concentration of dioxins in soil and sediments to the following preliminary remediation goals (PRGs):

Area	Unit	PRG
On-base Site 8 Surface Soil, Ash, and Sediments	ppt	38
On-base Non-Site 8 Surface Soil and Sediment	ppt	38
Off-base Soil (Area 2)	ppt	15
Off-base Sediment, shallow water (Area 1)	ppt	38
Off-base Sediment, deep water (Area 3)	ppt	1000

Note: Off-base areas 1, 2, and 3 are shown on Figure 1B.

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives for Site 8 and associated areas are presented in the following section. These alternatives are composed of general response actions that were assembled to achieve the cleanup objectives. The general response actions considered include No Action; Limited Action; Containment; Removal; In-Situ Treatment; Ex-Situ Treatment; and Off-site Disposal. The alternatives are numbered to correspond with the numbers presented in the Focused Feasibility Study report (Tetra Tech 2001b).

Two of the alternatives require institutional controls such as deed restrictions (easement or covenant) to limit the use of portions of the property or to ensure that water is not used for drinking purposes. These use restrictions are discussed in each alternative as appropriate. The type of restriction and enforceability will need to be determined for the selected remedy in the Record of Decision. Consistent with the expectations set out in the Federal regulations, none of the remedies rely exclusively on institutional controls to achieve protectiveness.

Alternative 1: No Action Alternative

Estimated Capital Cost:	*$0*
Estimated 30-Yr Net Present Worth (NPW) of Operation & Maintenance (O & M)Costs:	
30-Yr NPW:	*$0*
Estimated Construction Timeframe:	*Not Applicable*
Estimated Time to Achieve RAOs:	*Will not achieve RAOs*

Federal regulations require that the "no action" alternative be evaluated generally to establish a baseline for comparison. Under this alternative, no action would be taken at the site to prevent exposure to the soil and sediment contamination.

Alternative 2: Institutional Controls and Monitoring

Estimated Capital Cost:	*$32,000*
Estimated 30-Yr NPW of O & M Costs:	*$277,000*
30-Yr NPW:	*$309,000*
Estimated Construction Timeframe:	*Not Applicable*
Estimated Time to Achieve RAOs:	*Will not achieve RAOs within reasonable amount of time.*

All contaminated soils and sediments would be left in-place. Institutional controls would be implemented to restrict access to contaminated areas thereby preventing human and ecological exposure. Signs would be posted at the contaminated areas to provide notice of potential exposure to hazardous wastes. Land use controls would be prepared and implemented to prevent residential development at the contaminated areas.

Samples of soil, soil ash, sediment, surface water, and groundwater would be collected annually and analyzed for dioxins. Samples would be collected both in the areas of known contamination and immediately outside of these areas to detect potential migration. This monitoring may be performed for a period of 30 years subject to periodic performance reviews to be conducted to determine the continued effectiveness of this alternative.

Alternative 3: Excavation, Surface Water Controls, Dewatering, Chemical Stabilization and On-base Landfilling, Capping, Institutional Controls, and Monitoring

Estimated Capital Cost:	*$8,458,000*
Estimated 30-Yr NPW of O & M Costs:	*$277,000*
30-Yr NPW:	*$8,735,000*
Estimated Construction Timeframe:	*Year 2003*
Estimated Time to Achieve RAOs:	*Year 2003*

Approximately 58,000 cubic yards of soil ash, soil, and sediments would be excavated from Areas 8A, 8B, and 8C, on-base surface drainage ditches, and off-base swampland. Sheet piling and pumping would be used to divert surface water from areas of sediment excavation and silt screens would be installed to minimize contaminated sediment migration. Wet sediment would be dewatered through static stockpiling. The mixture of soil ash, soil, and dewatered sediment would be spread in four lifts, each approximately 10-inch thick, over Area 8A. Each lift would be chemically stabilized with Portland Cement. The stabilized material would then be capped with a multi-layer cover system designed in accordance with MDEQ regulations and State highway compaction specifications known as Highway 20.

Institutional controls would be implemented to restrict access to contaminated areas thereby preventing human and ecological exposure. Signs would be posted at the contaminated areas to provide notice of potential exposure to hazardous wastes. Land use controls would be prepared and implemented to prevent residential development of contaminated areas.

Monitoring would consist of periodic collection of soil and sediment samples as well as groundwater samples from monitoring wells located downgradient from the former HO storage area to detect any potential migration or leaching of dioxin.

Alternative 4: Excavation, Surface Water Controls, Dewatering, and Off-base Incineration

Estimated Capital Cost:	*$61,516,000*
Estimated 30-Yr NPW of O & M Costs:	*$0*
30-Yr NPW:	*$61,516,000*
Estimated Construction Timeframe:	*To Be Determined*
Estimated Time to Achieve RAOs:	*Less than 1 year*

This alternative would be identical to the excavations discussed in Alternative 3 in that all excavated media in Alternative 3 in addition to the excavated media from Area 8A would be transported to a permitted off-base facility that would treat these materials through high-temperature incineration and dispose of the resulting ashes. All transported materials would be manifested.

EVALUATION OF ALTERNATIVES

Nine criteria were used to evaluate the different Remedial alternatives individually and against each other in order to select a remedy (Table 3). This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The "Detailed Analysis of Alternatives" can be found in the Focused Feasibility Study (Tetra Tech 2001b).

1. Overall Protection of Human Health and the Environment

Alternative 1 would not provide protection of human health and the environment because dioxin would remain in soil, soil ash, and sediment in excess of PRGs and could result in unacceptable risk to human and ecological receptors. Also, under this alternative, no warning would be provided of the potential for migration of dioxin to continue in sediment and surface water since no monitoring would occur.

Although Alternative 2 would still allow dioxin to remain in soil, soil ash, and sediment, and possibly to continue migrating from the contaminated areas, it would provide some protection by restricting access to contaminated media and warning of potential contaminant migration.

Table 3 Evaluation Criteria for Remedial Alternatives
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets Federal and State Environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risk the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to - 30 percent.
State Acceptance considers whether the State agrees with the Air Force's and Navy's analyses and recommendations, as described in the Focused Feasibility Study and the Proposed Plan.
Community Acceptance considers whether the local community agrees with the Air Force's and Navy' s analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Alternative 3 would be more protective than Alternative 2 because it would essentially eliminate the potential for exposure to dioxin by removing contaminated soil, soil ash, and sediment and stabilizing and containing these media within an on-base landfill. Alternative 3 would also provide a warning of the unlikely migration of dioxin from the landfilled material to groundwater and prevent any future site development, which would compromise the structural integrity of the landfill.

Alternative 4 would provide the highest level of protection because it would not only remove contaminated soil, soil ash, and sediment from their present locations, but also destroy their dioxin content through high-temperature incineration.

2. Compliance with ARARs and TBCs

Alternative 1 would not comply with chemical- and location-specific ARARs. Action-specific ARARs or TBCs would not apply.

Alternatives 2 and 3 would not comply with chemical-specific ARARs and TBCs due to the pervasiveness of dioxin throughout the environment. Alternatives 2 and 3 would comply with location- and action-specific ARARs and TBCs.

Alternative 4 would comply with chemical-, location-, and action-specific ARARs and TBCs.

3. Long-Term Effectiveness and Permanence

Alternative 1 would have very limited long-term effectiveness and permanence because no contaminant removal or reduction would occur through treatment although, over time, some contaminant reduction might occur through natural attenuation. As there would be no institutional controls to restrict access to areas of contaminated soil, soil ash, and sediment, the potential would also exist for unacceptable risk to develop due to exposure to dioxin. Since there would be no monitoring, potential dioxin migration would remain undetected.

Alternative 2 would provide some long-term effectiveness and permanence since it would reduce risk from exposure to contaminated soil, soil ash, and sediment, and would warn of potential dioxin migration while natural attenuation might eventually reduce dioxin concentrations down to the PRGs.

Alternative 3 would be more long-term effective and permanent than Alternative 2 because it would remove contaminated soil, soil ash, and sediment from the present locations and effectively stabilize and contain it within a landfill. The landfill cap and chemical stabilization would minimize the risk of human and ecological exposure to dioxin. Alternative 3 would also effectively warn of possible dioxin migration and preserve the structural integrity of the landfill cap.

Alternative 4 would be most long-term effective and permanent. This alternative would remove the contaminated soil, soil ash, and sediment from the present locations and haul it to a permitted incineration facility. Although high-temperature incineration might not achieve the required 99.9999 percent destruction and removal efficiency, it would nonetheless effectively and permanently destroy most of their dioxin content.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Alternatives 1 and 2 would not achieve any reduction of toxicity, mobility, or volume of dioxin-contaminated media through treatment. Both alternatives might eventually achieve reduction of contaminant toxicity and volume through natural attenuation, but the timeframe is unknown. Under Alternative 1, this reduction could neither be verified nor quantified. Under Alternative 2, there would be no treatment of any residual contamination.

Alternative 3 would not achieve any reduction of toxicity or volume of dioxin-contaminated media through treatment. However, Alternative 3 would significantly reduce dioxin mobility through chemical stabilization and containment in a landfill. A wastewater residual might be generated by the sediment dewatering step, but it is anticipated that this wastewater could be discharged to surface water without treatment.

Alternative 4 would achieve a significant reduction of toxicity, mobility, and volume of dioxin contaminated media through removal and treatment. An estimated 58,000 cubic yards of contaminated material would be permanently removed from the site and the dioxin content of this material would be irreversibly destroyed through high-temperature incineration. Alternative 4 might generate the same wastewater residual from the sediment dewatering operations as Alternative 3. In addition, as a result of incineration of dioxin-contaminated media, Alternative 4 would also generate an ash residual and, possibly, a liquid waste residual from off-gas treatment. These incineration residuals would require proper handling and disposal.

5. Short-Term Effectiveness

Implementation of Alternative 1 would not result in risks to site workers or adversely impact the surrounding community or environment since no remedial activities would be performed. Alternative 1 would never achieve the RAOs and although the dioxin cleanup goals might eventually be attained through natural attenuation processes, this would not be verified.

Implementation of Alternative 2 would result in a slight possibility of exposing site workers to dioxin contamination during long-term monitoring activities. However, this risk of exposure would be effectively controlled through compliance with proper site-specific health and safety procedures. Implementation of Alternative 2 would not adversely impact the surrounding community or environment. Alternative 2 would achieve the RAOs immediately upon implementation of institutional controls and monitoring. The dioxin cleanup goals might be attained through natural attenuation, but the required timeframe cannot be accurately estimated.

Implementation of Alternatives 3 and 4 would result in the possibility of exposing construction workers to dioxin contamination during remedial activities. However, the risk of exposure would be effectively controlled by the implementation of engineering controls such as dust suppression and compliance with applicable health and safety regulations and proper site-specific health and safety procedures. Implementation of Alternatives 3 and 4 would potentially impact the surrounding community because dioxin-contaminated material would be transported over public roads. In addition, alternative 4 could impact the surrounding community because of off-gas emissions from the incineration facility. However, the potential for adverse impact would be effectively addressed through implementation of such appropriate measures as decontamination of transport vehicles, traffic control, spill prevention and emergency response, and incineration emissions treatment.

Alternatives 3 and 4 would achieve the RAOs immediately upon removal of the contaminated soil, soil ash and sediment. Alternative 3 might attain the dioxin cleanup goals through natural attenuation, but the required timeframe cannot be accurately estimated. Alternative 4 would attain the dioxin cleanup goals within one year.

6. Implementability

Alternative 1 would be extremely simple to implement since no action would occur.

The technical implementability of Alternative 2 would be very simple, since it would only require implementation of the institutional controls and monitoring.

The technical implementability of Alternative 3 would be somewhat more difficult than that of Alternative 2. In addition to institutional controls and monitoring, this alternative would require the excavation of contaminated soil, soil ash, and sediment with surface water controls, the dewatering of sediment, the chemical stabilization and on-base landfilling of the excavated materials, and the capping of the stabilized materials. However, these activities are technically implementable and their effectiveness would be verified prior to implementation through pilot-scale testing. Resources, equipment and materials are readily available to perform the tasks associated with Alternative 3.

Although it would require a reduced number of sequential operational steps as compared to Alternative 3, Alternative 4 would be somewhat harder to implement. Resources, equipment and materials are readily available to perform the excavation, dewatering, and transportation activities but the number of off-base incineration facilities that might accept the dioxin-contaminated material for treatment is likely to be extremely limited and securing acceptance of this material might be quite difficult.

Administratively, Alternatives 2 and 3 would require the development and implementation of land use controls, and the performance of long-term monitoring and 5-year site reviews. Alternative 3 would also require authorization for the excavation of the off-base sediment and a permit for the construction of the on-base landfill. Alternative 4 would not require land use controls, long term monitoring or 5-year reviews associated with a cap at Site 8 but would require controls and monitoring similar to Alternative 3 for all other areas. It would also require authorization for the excavation of the off-base sediment, manifesting of the material to be transported off-base, and formal acceptance of this material by the off-base incineration facility. These administrative requirements could be met.

7. Cost

The capital and operation and maintenance costs, and net present worth of the alternatives are summarized as follows:

Alternative	Capital ($)	30-year NPW of O&M ($)	30-year NPW ($)
1	0	0	0
2	32,000	277,000	309,000
3	8,458,000	277,000	8,735,000
4	61,516,000	0	61,516,000

8. State/Support Agency Acceptance

The State of Mississippi supports the Preferred Alternative without comment.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for Site 8 and associated areas.

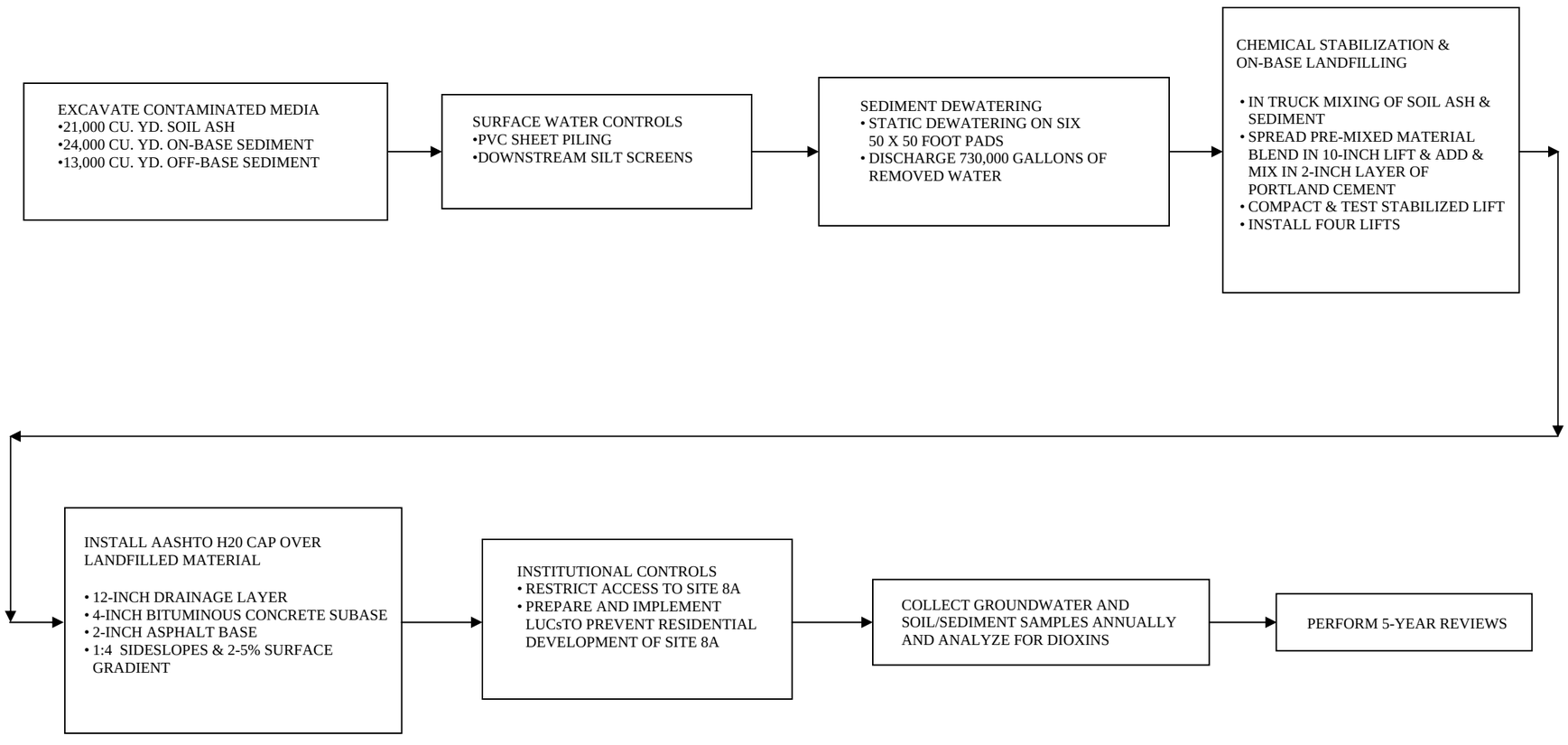
SUMMARY OF THE PREFERRED ALTERNATIVE

As shown in Figure 4 Alternative 3 would consist of seven major technology components: (1) excavation of contaminated soil ash, soil, and sediments, (2) surface water controls, (3) dewatering of excavated sediments, (4) chemical stabilization and on-base landfilling of all excavated media, (5) capping of stabilized media mix, (6) institutional controls, and (7) monitoring.

This alternative was selected over other alternatives because it is expected to achieve substantial and long-term risk reduction through removal of contaminated media from their present locations. It is better than Alternative 2 because in addition to institutional controls and monitoring, it includes treatment of contaminated soil, soil ash, and excavated sediments and consolidating it as chemically stabilized mix in a secured on-base landfill. Residual dioxins left at the sites after excavations will be at levels that would not pose unacceptable risks to human health and the environment. Reduction of toxicity and volume may be possible through natural attenuation in the landfilled media but the timeframe cannot be accurately determined at this time. Alternative 4 would destroy dioxins in the contaminated media through incineration but it would present a significant level of short-term risk to the community during hauling of contaminated media over long distance to the closest permitted incineration facility. In addition, the estimated cost for incineration is prohibitively high at $61 million.

Long-term risk control will be provided by the landfill cap which would be designed according to state highway construction specifications and the institutional controls which would allow productive use of the site while maintaining protection of site workers and other potential receptors. Monitoring will provide a means to verify that chemical stabilization prevents dioxins from contaminating the groundwater as well as detection of potential surface soil accumulation and contaminated sediment migration.

EXCAVATION, SURFACE WATER CONTROLS, DEWATERING, CHEMICAL STABILIZATION, AND ON-BASE LANDFILLING, CAPPING, INSTITUTIONAL CONTROLS AND MONITORING



NOTES:
AASHTO AMERICAN ASSOCIATIONS OF STATE HIGHWAY TRANSPORTATION OFFICIALS
H20 HIGHWAY 20
LUCs LAND USE CONTROLS

Figure 4

Block Flow Diagram
Alternative 3

Based on the information available at this time, the Air Force and the Navy believe Alternative 3 would be most protective of human health and the environment, would comply with the ARARs and TBCs, would be cost-effective, and would utilize alternative treatment technologies to the maximum extent practicable. Because it would treat the source materials constituting principal threats, the remedy also would meet statutory preference for the selection of a remedy that involves treatment as a principal element. The Preferred Alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

The Navy and Air Force provide information regarding the cleanup of the Site 8 and associated drainage ditches to the public through public meetings, the Administrative Record file for the site, and announcements published in The Sun Herald, a Gulfport, Mississippi newspaper. The Navy and Air Force encourage the public to gain a more comprehensive understanding of the site and the remedial activities that have been conducted at the site.

For further information on the Site 8 and associated areas, please contact:

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5200 CBC 2nd Street
Gulfport, MS 39501
(228) 871-2393
(228) 871-2699

Gordon Crane,BF
Environmental Programs Mgr.
5200 CBC 2nd Street
Gulfport, MS 39501
(601) 871-2699

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan.

REFERENCES

1. Arienti, M., L. Wilk, M. Jasinski, and N. Prominski, 1988. Dioxin-Containing Wastes Treatment Technologies, Pollution Technology Review No. 160: Published by Noyes Data Corporation, Park Ridge, New Jersey, U.S.A.
2. ABB Environmental Services, Inc., 1995. Letter Report: Interim Removal Action – 28th Street Road Construction at NCBC Gulfport, MS
3. ABB Environmental Services, Inc., April 1996. Interim Corrective Measures Work Plan Site 8, Former Herbicide Orange Storage Areas. NCBC, Gulfport, MS
4. ATSDR, 1997. Dioxin and Dioxin-like Compounds in Soil (http://www.atsdr.cdc.gov/dioxindt.html).
5. De Rosa, Christopher T. et. al., 1997. Dioxin and Dioxin-Like Compounds in Soil, Part 1: ATSDR Interim Policy Guideline, U.S. Department of Health and Human Services. Atlanta, Georgia.
6. EG&G, 1988. Comprehensive Soil Study at the NCBC Gulfport, MS.
7. Harding, Lawson & Associates (HLA), 2001. Human Health Risk Assessment and Screening Level Ecological Risk Assessment of Dioxins and Furans Associated With Former Herbicide Orange Storage at NCBC Gulfport, MS
8. Hazardous Waste Remedial Action Program (HAZWRAP), 1991. Air Force Installation Restoration Program, Summary Report Remedial Characterization and Soil Remediation Technology Review for the Former Herbicide Orange Storage Site at the NCBC, Gulfport, MS.
9. Tetra Tech NUS, Inc., 2001a. Work Plan Pilot Scale Soil/Sediment Treatability Study Site 8 Herbicide Orange Study Area at NCBC Gulfport, MS.
10. Tetra Tech NUS, Inc., 2001b. Final Focused Feasibility Study Site 8 Herbicide Orange Study Area at NCBC Gulfport, MS December 2001.
11. EPA, 2001. Fact Sheet: DIOXIN (2,3,7,8-TCDD). (http://www.epa.gov/safewater).

GLOSSARY OF TERMS

Specialized terms used in this Proposed Plan are defined below:

Administrative Order (AdmO)/Agreed Order (AO) – a legal document approved by a judge, that formalizes an agreement between the MDEQ and Navy and Air Force outlining the terms by which the delineation, and if warranted, remediation of dioxin contamination at Site 8 and associated ditches will be carried out.

Applicable or relevant and appropriate requirements (ARARs) – the Federal and State environmental laws that a selected remedy will meet. These requirements may vary among sites and alternatives.

ATSDR (Agency for Toxic Substances and Disease Registry) - an agency of the U.S. Department of Health and Human Services. Their mission is to prevent exposure and adverse human health effects and diminished quality of life associated with exposure to hazardous substances from waste sites, unplanned releases, and other sources of pollution present in the environment.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980) - commonly known as Superfund, was enacted by Congress on December 11, 1980. This law provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

COC (Chemical of Concern) – Chemicals that are potentially site-related and whose data are of sufficient quality for use in the quantitative risk assessment.

CTE (Central Tendency Exposure)- a risk descriptor representing the average or typical individual in a population, usually considered to be the mean or median of the distribution. The term "central tendency" is also used to describe the risk associated with the CTE.

Dioxins - a term used in this Proposed Plan that refers to a group of chemicals known as polychlorinated dibenzodioxins and furans. There are 17 forms or "congeners" of dioxins and furans of varying toxicities that were considered during Site 8 investigations. The most toxic congener is **2,3,7,8-tetrachloro-p-dioxin or TCDD**, a known impurity by-product during manufacture of herbicide 2,4,5-T.

2,4-D - a colorless, odorless powder used as a herbicide for the control of broad-leaf weeds in agriculture, and for control of woody plants along roadsides, railways, and utilities rights of way. It has been most widely used on such crops as wheat and corn, and on pasture and rangelands.

Groundwater – underground water that fills pores in soil or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

Herbicide Orange (HO)- a herbicide formulation used during the Vietnam War to defoliate trees and shrubbery. It is an equal mix of two agricultural herbicides **2,4,-D** and **2,4,5-T** in diesel fuel or jet fuel. HO is also known as "**Agent Orange,"** a code name for the orange band that was used to mark the drums used to store the herbicide mix.

ILCR (Individual Lifetime Cancer Risk) – the likelihood or probability of developing cancer or tumor incidence for an individual from a lifetime exposure to a carcinogen.

Land use control (LUC) or institutional control – means the limitation on use of or access to a remediation site to reduce or eliminate the potential for exposure to contaminants. These restrictions may include, but are not limited to, deed restrictions, use restrictions, or restrictive zoning.

MDEQ (Mississippi Department of Environmental Quality) – the regulatory agency for the State of Mississippi that oversees the investigation and remediation of contamination at Site 8 and associated drainage ditches.

Monitoring –ongoing collection of information about the environment that helps gauge the effectiveness of a clean-up action. Monitoring wells associated with Site 8 would be used to detect any leaks from the chemically-stabilized landfilled materials.

Natural attenuation – is a process that includes a variety of physical, chemical, or biological transformations that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants.

Organic compounds – carbon compounds, such as solvents, oils, and pesticides. Most are not readily soluble in water. Some organic compounds can cause cancer.

Present worth analysis – a method of evaluation of expenditures that occurs over different time periods. By discounting all costs to a common base year, the costs for different remedial action alternatives can be compared on the basis of a single figure for each alternative.

PRG (Preliminary Remediation Goal) – developed by EPA Region 9 as a guide to establish risk-based media concentrations of specific chemicals that would be considered protective of human health and the environment.

RBCs (Risk-Based Concentrations) – concentration levels for individual chemicals that correspond to a specific cancer risk level (e.g., 10^{-6}, 10^{-4}) or hazard quotient (HQ) or hazard index (HI) (e.g., less than equal to 1). They are generally selected as preliminary or final remediation goals when ARARS are not available.

RCRA (Resource Conservation and Recovery Act) – the Federal act that established a regulatory system to track hazardous wastes from the time that they are generated to their final disposal. RCRA also provides for safe hazardous waste management practices and imposes standards for transporting, treating, storing, and disposing of hazardous waste.

RME (Reasonable Maximum Exposure) – the highest estimated exposure that is reasonably expected to occur at a site through individual or a combination of pathways.

Risk assessment – a site-specific characterization of the current or potential threats that may be posed to human health and the environment by contamination discharging to the air, leaching through or remaining in the soil, bioaccumulating in the food chain, or other complete pathways.

Sediment – means particles in surface waters or wetlands or on the bottom of surface waters or wetlands that are derived from the erosion of rock, minerals, soils, and biological materials, as well as chemical precipitation from the water column. Sediment particles are transported by, suspended in, or deposited by water.

2,4,5-T, an agricultural herbicide banned for use in the United States since 1989.

TBC (To Be Considered) – Federal and State non-promulgated advisories or guidance not legally binding and that do not have the status of potential ARARs. These advisory criteria should be identified and used if there are no specific ARARs for a chemical or site condition, or if ARARs are not deemed sufficiently protective.

TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) – a dioxin congener found in HO. It has the highest toxicity rating relative to the other known dioxins.

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for Site 8 and associated areas is important to us. Your comments will help us select a final cleanup remedy for the site.

You may use the space below to write your comments, then fold and mail to:

Joan Remley, PAO
Commanding Officer, Code 15
Naval Construction Battalion Center
4902 Marvin Shields Boulevard
Gulfport, MS 39501

Comments must be postmarked by 5 PM on May 5, 2002. If you have any questions about the comment period, please contact Jean Remley, PAO at (228) 871-2393 or 871-2699. Those with electronic communications capabilities may submit their comments to the e-mail address: **jaremley@cbcgulfport.navy.mil**.

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